been able to bring forward for the direct anatomical continuity of nerve-cells through their dendrons. Nerve-cells, as he finds them in a number of retinæ of different animals, are not isolated elements, as is generally taught at present, but cells usually of similar types are joined by their dendrons into cell-colonies. Further an axis-cylinder may arise in three ways: a, from the cell-body direct; b, from the network formed by branching of neurons; c, from the network of dendrons. The method employed, methyl blue staining, exhibits a difference between neurons and dendrons similar to that by the Golgi method. But since fibrillæ from these processes may unite to form an axis-cylinder, they must be unconditionally considered to be of "Nervennatur." Thus far the author's work has been confined to the retina; but there is no good reason for supposing that relations of cells are different here from their relations in other parts of the central nervous system. This work, therefore, if confirmed, must negative the accepted doctrine of isolated cell-elements.

A Physiological, Histological and Clinical Study of the Degeneration and Regeneration in Peripheral Nerve Fibers after Severance of Connections with the Nerve Centers. W. H. HOWELL AND G. C. HUBER. *Journal of Physiology*, Vol. XIII. 1893, pp. 335-406; Plates XII. to XVI.

The above paper was awarded a prize offered by the American Physiological Society for the best essay upon the subject. The chief object of the research was to test experimentally the possibility of "union by first intention" of a nerve severed from its central connections; together with a thorough study of histological steps in processes of degeneration and regeneration. Dogs were used in all but one experiment, which was made upon a rabbit, and the ulnar and median nerves were either cut, cut and sutured, crushed by a ligature, immediately loosened, or coagulated by contact with a tube, through which water at 80° was allowed to flow. The first result to be noted is that in no case did "union by first intention" take place. In all the experiments degeneration of the peripheral end was complete through its entire length. Certain authors have described experiments in which both sensory and motor functions became re-established in a severed nerve in a few hours. In these experiments the least time in which irritability began to return to parts peripheral to the cut is twenty-one days; and at this time regeneration is found to have progressed some distance beyond the wound. Sensory nerves regain function before motor. Both sensory and motor function is found to be imperfect at the end of seven weeks and nearly normal by the end of eleven weeks.

The histological evidence as to the processes concerned has been made quite complete and is well illustrated by seventy-six figures. This evidence favors the view that embryonic fibers form in the distal nerve and subsequently unite in the cicatrix with the axis-cylinder as it grows out from the central end.

Histogenesis of the Retina in Amblystoma and Necturus. F. MALL. *Journal of Morphology*, Vol. VIII. pp. 415-432; 12 Figs. 1893.

The above paper fills a long-felt need by giving in a brief form a clear orientation of the layers and elements of the retina. Two principles of universal application to the growth of nerve tissue are stated at the outset. These are: 1. "The primitive growing point of all vetebrate nerves is in the layer of cells on the outermost side of the ectoderm, and the axis of division is parallel

with the ectoderm." 2. "The direction of transmission of an impulse is already determined by the position of the cell in the ectoderm." That is, the receiving side of a cell is the one originally toward the surface, while the giving pole is turned toward the interior of the body. Under these principles, and keeping in mind the formation of cerebral and optic vesicles, primary and secondary, it is made perfectly clear why the optic nerve fibers should grow first toward the vitrious chamber and afterwards pierce the retina in order to reach the brain. This also explains the inversion of the rod and cone layer, these elements being the receiving poles and the line between them, and the pigment layer of the retina being the original external surface of the body. The well chosen cuts render this intricate problem doubly lucid.

On the Method of Transmission of the Impulse in Medullated Fibers. E. R. EDES. *Journal of Physiology*, Vol. XIII. p. 431.

Experiments described in this paper were made in the physiological laboratory of the Harvard Medical School under the direction of Dr. Bowditch, and results confirm in the main that author's previous work upon the non-fatigability of nerve fibers.

The method employed consists in using the action current as a measure of the nerve impulse. This is read by means of a delicate capillary electrometer. The muscle was retained, and although not used to measure the impulse, gave a fine comparison of muscle and nerve fatigue. This is expressed in two charts (p. 437), both of which show that the muscle tires rapidly for the first few minutes, then more slowly and finally very slowly; the nerve on the other hand practically holds its own. Up to five hours' continuous stimulation, the action current suffered no diminution. That this is not true for longer periods was due to trouble with the electrometer. Experiments let run over night (11-14 hours) showed an action current of about one-fourth the original strength. According to Maschek, when such diminution occurs on cutting the nerve off so as to place a fresh cut section on the electrodes, the action current returned to normal. This was not the case with Edes' experiments. Herzen's strychnine experiments were also repeated on rabbits and frogs, the conclusion therefrom being, contrary to Herzen's, that the "exhaustion obtained could be located wholly in the muscle."

In a short addendum are summed up the results of a number of experiments made for the purpose of repeating Demoor's recent work upon the action of silver nitrate upon normal and exhausted nerve fibers. Demoor's statement is that "Frohmann's striations" are not found in exhausted nerves. The experiments of Edes gave the impression that stimulation "does make some *slight* difference in the behavior of the nerve fiber towards nitrate of silver."

Der Hund ohne Grosshirn. Siebente Abhandlung über die Verrichtung des Grosshirns. F. GOLTZ. Archiv. für die gesammte Physiol. Bonn, 1891, 2 Bd. LI. S. 570-614. 1 Taf.

This paper forms the strongest protest yet uttered against the doctrine of cerebral localization, so far at least as the dog is concerned.

Goltz gives us the results of removing the entire cerebral cortex (except a mere shaving of the inferior temporal lobes, left to protect the optic tracts) in three dogs. The first lived fifty-one days; the second, ninety-two days; the third lived eighteen and one-half months. In order to more fully meet the arguments of his opponents, the operations were performed with the knife.